The Examiner states that the title of the invention is not descriptive, stating that a new title is required that is clearly indicative of the invention to which the claims are directed.

The title of the invention is a "Defect Detection System and Method". Claims 1-11 recite "a defect detection system", and claims 12-19 recite "a method of detecting a defect in a sample". Accordingly, the applicant respectfully submits that the title of the invention is sufficiently descriptive of the invention to which the claims are directed.

The Examiner objects to claims 4-7 stating that the "acoustic wave" lacks proper antecedent basis, as there are several acoustic waves "longitudinal, surface Rayleigh, shear" that are generated. Claims 4-7 as amended clearly describe the particular waves to which the claims refer.

The Examiner rejects claims 1-19 under 35 U.S.C. §112, 2^{nd} paragraph, as being indefinite, stating that it is unclear whether the surface Rayleigh and shear waves generated by the excitation laser system are acoustical or optical. The Examiner further states that regarding claim 1, it is unclear whether the detection system merely detects the laser beam from the excitation laser system or actually emits a laser beam for interferometry purposes.

Claim 1 recites "an excitation laser system for projecting a laser beam at the near surface of a sample to be tested for generating acoustic longitudinal, surface Rayleigh, and shear waves in the sample". It is clear that in claim 1 the adjective "acoustic" applies the recited "longitudinal" waves, "surface Rayleigh" waves, and "shear waves". Moreover, in the applicant's specification at page 8, lines 10-13 the excitation laser is described as providing a beam that strikes the sample and "excites acoustic waves including longitudinal and shear waves 44, and surface Rayleigh waves 46". As stated in In Re Morris, 127 F.3d 1048, 1054-1055, 44 U.S.P.Q. 2d 1023, 1027 (Fed. Cir. 1997), when interpreting claim language:

> [T]he PTO applies to the verbiage of the proposed claims the broadest reasonable meaning of the words in their ordinary usage

as they would be understood by one of ordinary skill in the art, taking into account whatever enlightenment by way of definitions or otherwise that may be afforded by the written description contained in the applicant's specification.

It is therefore clear that claim 1 refers to acoustic longitudinal, surface Rayleigh and shear waves. In similar fashion, claim 12 also refers to acoustic longitudinal, surface Rayleigh and shear waves.

Also with respect to claim 1, it would be clear to one skilled in the art in light of the specification (see e.g., Morris, *supra*) that the detection laser system emits a laser beam. See for example the applicant's specification at page 10, lines 10-13 where it states "[d]etection laser 14 may be an interferometer type or photo-EMF...". Accordingly, it is clear that the applicant's detection laser system emits a laser beam and detects and intercepts shear waves.

The Examiner rejects claims 1-6, 8-15, and 17-19 under 35 U.S.C. §102(b) as being anticipated by U.S. Patent No. 5,549,003 to *Drescher-Krasicka. Drescher-Krasicka* discloses a unitary acoustic microscopic lens having a circular, spherical transmitting and receiving surface for transmitting ultrasonic waves to and receiving reflected waves from a sample. See *Drescher-Krasicka*, Abstract, and Fig. 6d reproduced below.

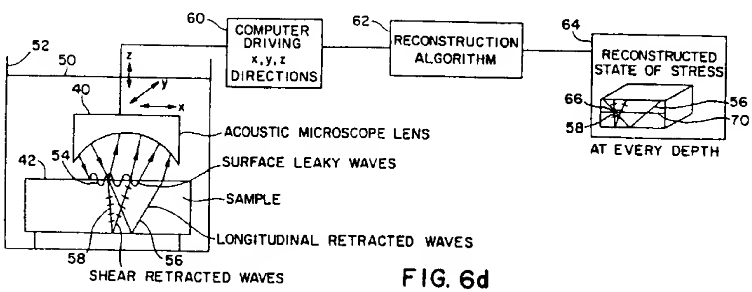

FIG. 6d

In contrast to *Drescher-Krasicka* which discloses a unitary excitation and detection

system which intercepts all waves at all angles of propagation, the applicant's claim 1 includes "a detection laser system spaced from said excitation laser to intercept shear waves reflected from the far surface of the sample at approximately the angle of maximum shear wave propagation". See also, for example, applicant's Figs. 3 and 4, reproduced below.

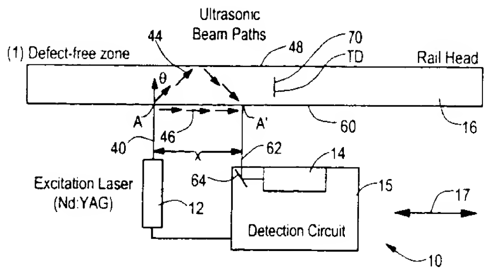

FIG. 3

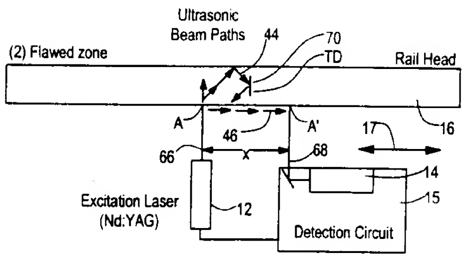

FIG. 4

The applicant's invention appreciates that the angle of maximum propagation for longitudinal waves decreases with increasing angle, while the shear wave has its maximum propagation at an angle which is a function of the spacing between the excitation laser system and the detection laser system. The applicant uses this claimed defect detection system, not disclosed by *Drescher-Krasicka*, to identify the size, location and orientation of a flaw in a sample. See also the applicant's specification at page 9, lines 1-8.

Accordingly, claim 1, as well as claims 2-11 which depend directly or indirectly from claim 1, are in condition for allowance.

Moreover, independent claim 12 claims a method of detecting a defect in a sample that includes "photo-acoustically detecting acoustic waves at a second point spaced from the excitation first point for intercepting shear waves reflected from the far surface of the sample at approximately the angle of maximum shear wave propagation", and so includes the same elements discussed above in claim 1 that distinguish claim 1 from the cited reference *Drescher-Krasicka*. Accordingly, independent claim 12, and claims 13-19 which depend directly or indirectly from claim 12, are also in condition for allowance.

Additionally, the applicant's dependent claims include elements not disclosed in *Drescher-Krasicka*, for example, a measuring circuit for measuring the length of each shadow cast by a flaw blocking shear wave propogation and the distance between those shadows (claim 9). In contrast, *Drescher-Krasicka* discloses black, white and grey areas.

The Examiner also rejects claims 7 and 16 under 35 U.S.C. §103(a) as being unpatentable over *Drescher-Krasicka*. The Examiner states in essence that with respect to claim 7 it would have been obvious to one of ordinary skill in the art to include a second logic circuit to prevent a false positive reading; and with respect to claim 16 that it would have been obvious to one of ordinary skill in the art to sense the surface Rayleigh waves to inhibit flaw detection according to a predetermined energy level to prevent a false positive reading.

Dependent claim 7 depends ultimately from independent claim 1, and dependent claim 16 depends from independent claim 12. As discussed above, *Drescher-Krasicka* does not disclose all of the elements of the applicant's independent claims 1 and 12, and therefore does not disclose or teach all of the elements included in claims 7 and 16. Accordingly, claims 7 and 16 are also in condition for allowance.

CONCLUSION

Accordingly, claims 1-19 are in condition for allowance. Each of the Examiner's rejections has been addressed or traversed. It is respectfully submitted that the application is in condition for allowance. Early and favorable action is respectfully requested.

If for any reason this Response is found to be incomplete, or if at any time it appears that a telephone conference with counsel would help advance prosecution, please telephone the undersigned or his associates, collect in Waltham, Massachusetts at (781) 890-5678.

Respectfully submitted,

Thomas E. Thompkins, Jr.
Reg. No. 47,136

1. A defect detection system comprising:

an excitation laser system for projecting a laser beam at the near surface of a sample to be tested for generating acoustic longitudinal, surface Rayleigh, and shear waves in the sample;

a detection laser system spaced from said excitation laser to intercept shear waves reflected from the far surface of the sample at approximately the angle of maximum shear wave propagation; and

a detection circuit for detecting the energy level of the reflected shear wave intercepted by said detection laser system representative of a flaw in the sample.

2. The defect detection system of claim 1 in which the excitation laser system and detection laser system are on the same side of the sample.

3. The defect detection system of claim 1 including a movable support for said excitation laser system and detection laser system for moving them along the sample.

4. The defect detection system of claim 1 in which said detection circuit includes a shear wave sensing circuit for sensing the energy level of the ~~acoustic wave~~ and the time of arrival of the reflected shear wave at the detection laser system.

5. The defect detection system of claim 4 in which said detection circuit includes a first logic circuit for recognizing the presence of a potential flaw if the energy level of the ~~acoustic wave~~ sensed by said shear wave sensing circuit is less than a predetermined level.

6. The defect detection system of claim 5 in which said detection circuit includes a surface Rayleigh wave sensing circuit for sensing the energy level of the ~~acoustic wave~~ at the time of arrival of the surface Rayleigh wave at the detection laser system.

7. The defect detection system of claim 6 in which said detection circuit includes a second logic circuit for inhibiting recognition of a potential flaw if the energy level of the ~~acoustic wave~~ sensed by said surface Rayleigh wave sensing circuit is less than a predetermined level and confirming recognition if it is greater than the predetermined level.

8. The defect detection system of claim 1 in which said detection circuit includes a scanning device for sensing the variation in the energy level of the reflected shear wave along the sample to create shadows of a flaw.

9. The defect detection system of claim 8 in which said detection circuit includes a measuring circuit for measuring the length of each shadow cast by a flaw blocking shear wave propagation and the distance between those shadows.